US Experiences in Integration of Demand-Side Resources and Market Mechanisms

美国经验介绍：需求侧资源的整合利用与市场化机制的推动

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Beijing　北京

Outline

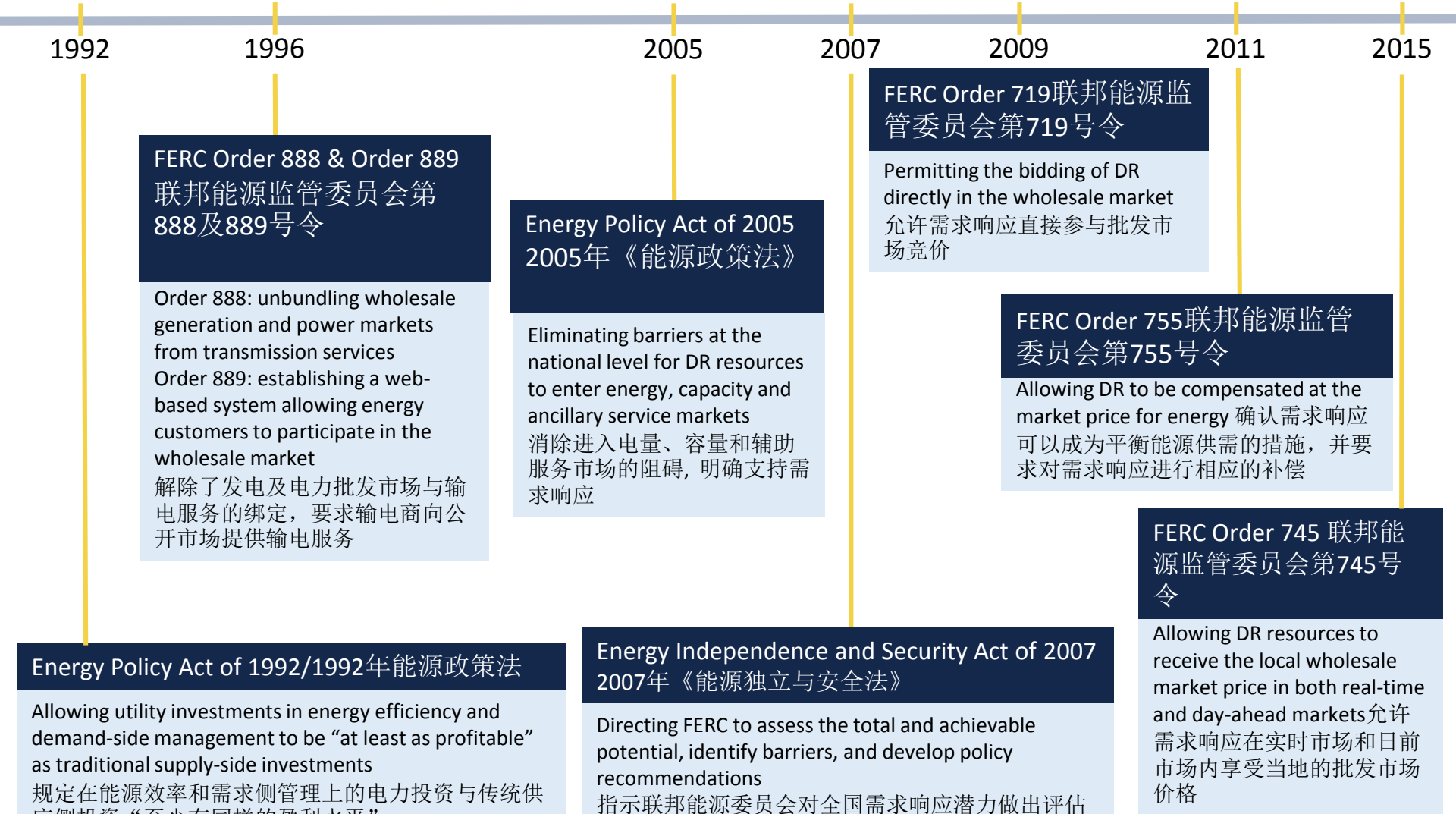
大纲

- Polices at a glance
- New challenges
- New developments

- 政策回顾
- 新的挑战
- 新发展

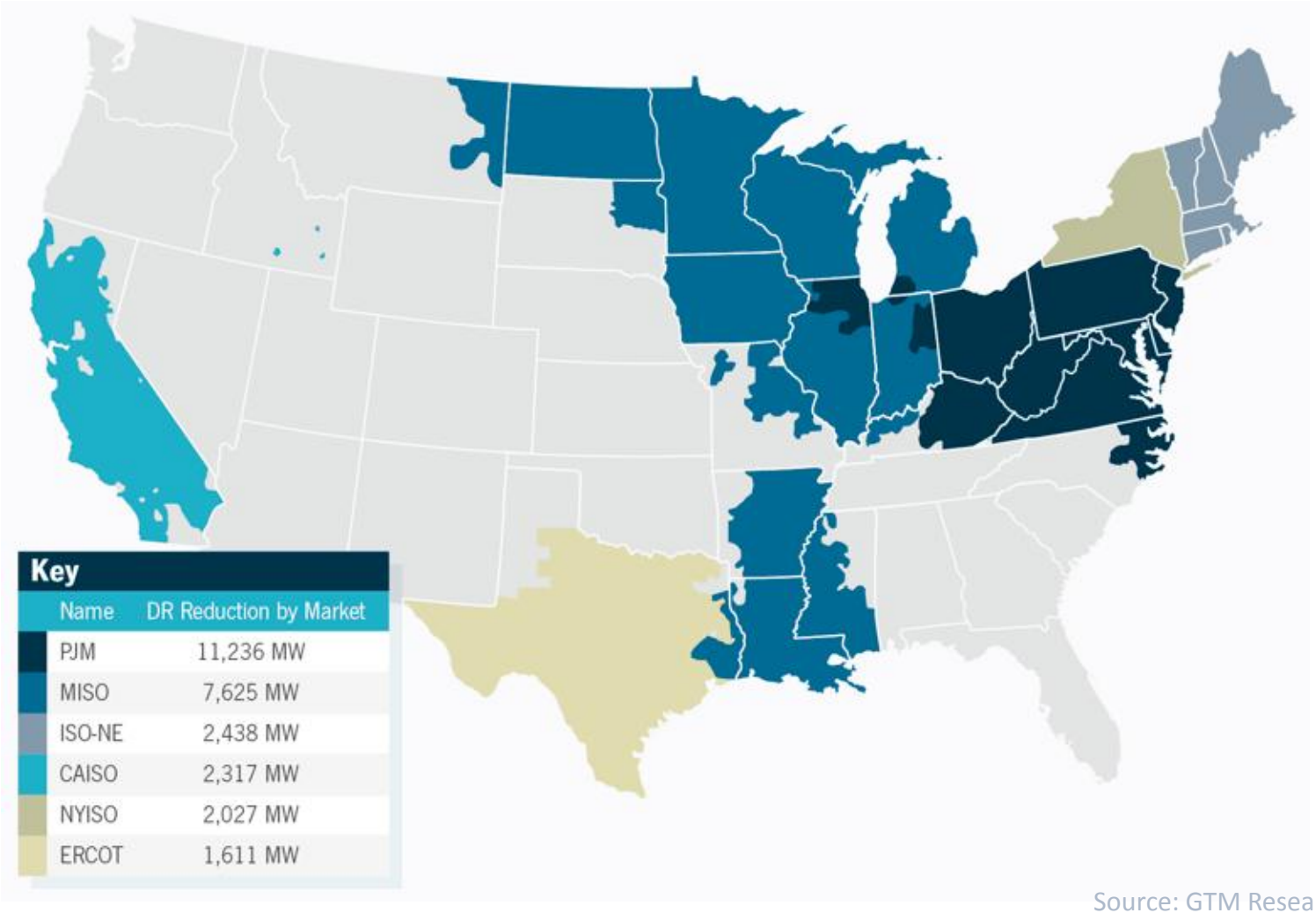
Policies are essential for DR development

扶持政策是需求响应发展的关键



Different types of markets and mechanisms exist

美国各个地区建立不同类型、不同规模的市场机制



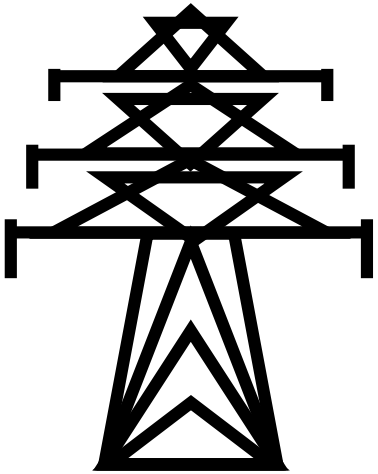
Source: GTM Research, 2014

Power grid has been facing new challenges

电网系统面临新挑战

Historically | 以前

- Safe operation
  电网系统安全运行
- Reliable power supply
  确保供电



Now | 现在

- Smarter grid
  智能化
- More flexibility
  提高灵活性

Several factors exist behind these new challenges

不同因素导致了这些新挑战

Growing energy efficiency
Slowing-down growing rate of electricity sales
能效的提升、售电量增长速度缓慢

Increasing application of demand-side resources
需求侧资源的广泛利用

More pressure on cleaner, more efficient electricity service
政策目标要求更清洁、更具有成本效益的电力资源

Increasing non-utility market actors
电力公司以外，更多服务商进入电力市场

Aging grid infrastructure
电网基础设施老化

能效

需求侧资源

清洁能源消纳

负荷集成商

成本效益

Demand response (DR) helps address the challenges

需求响应有助于应对新挑战

Changing conditions promote aggregated demand side resources

变化的条件有助于促进需求侧资源的聚合

Aggregating demand side resources (e.g. appliances, battery storage, EV, PV, etc.) can provide diverse products that:

汇总需求侧资源（如电器、电池、电动车、光伏电池等）能提供多样化的产品：

- Quickly respond to shifting supply and demand 快速响应不断变化的供需要求
- Provide year-round value and service (seasonal, daily, hourly, etc.) 提供全年的价值和服务（季节性，每日，每小时等）

PJM – Capacity Performance for Emergency DR

PJM – 应急DR容量性能要求

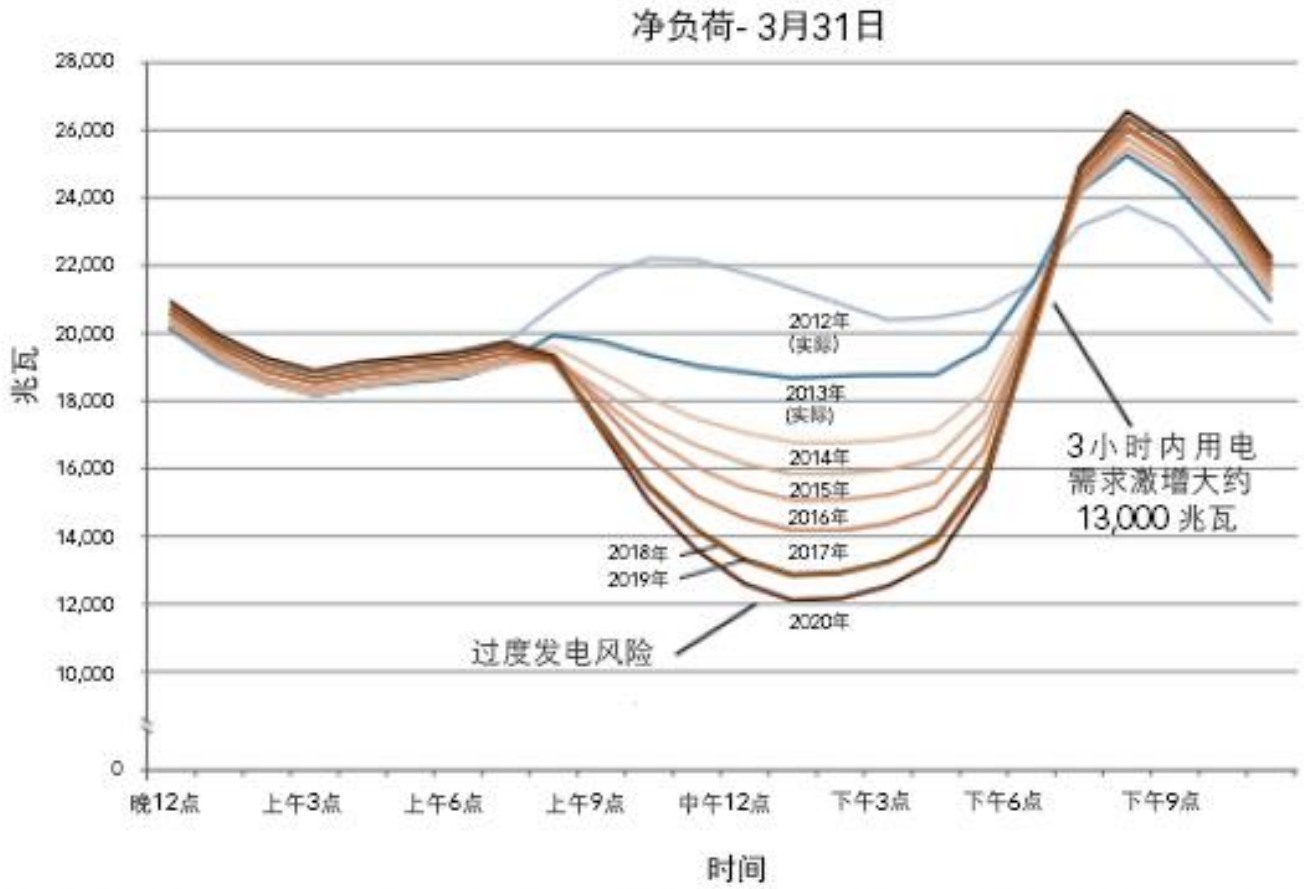
Generators
- must meet their commitments to deliver electricity whenever PJM determines they are needed;
- may receive higher capacity payments as a “pay-for-performance” requirement;
- that exceed performance commitments will be entitled to funds collected from generators that underperform;
- assume virtually all financial risks if they do not meet their power supply obligations. (for 2018/19 delivery year)

发电方
- 依PJM决定必须满足其提供电力的承诺
- 按绩效可能会收到更高的容量付款
- 如超过业绩承诺将有权获取从未达承诺方收集的资金
- 承担几乎所有不满足供电义务金融风险

（供应年2018/19）

Dispatchable DR helps California to meet energy needs

可调度需求响应已用于满足加州的能源需求



- Avoid use of fossil fuel
  避免使用化石燃料
- Preferred option for renewable electricity generation
  可再生能源发电的首选方案

每日电力供需预测显示，由于太阳能和风能的加入，加州电网正在出现新变化，即午间用电净负荷下降，傍晚出现急剧攀升的负荷尖峰。这种现象因其形状被称为“鸭形曲线”。

预计3月31日（2012-2020年）净负荷增长趋势迅猛，存在过量发电风险。

California integrates distributed energy resources to market

加州把分布式能源资源纳入到电力市场

Aggregated Individual Energy Resources | 集成的个体能源资源

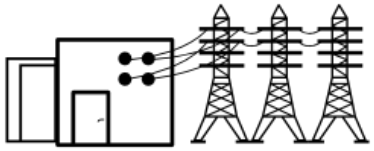
0.5 MW ≦

rooftop solar | 分布式光伏
plug-in electric vehicles
插电式电动汽车
energy storage | 储能
demand response resources
需求响应资源

Considered as a market resource | 作为市场资源可参加电力市场

Utility pilot with managed charging, and battery storage providing grid services

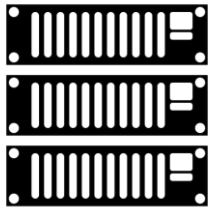
电力公司试点利用有序充电及电池储能提供电网服务



PG&E

1

PG&E contacts BMW server (OpenADR 2.0b) to request load drop
PG&E 联系(利用OpenADR 2.0b)宝马的服务器请求负荷降低



宝马服务器
BMW Server

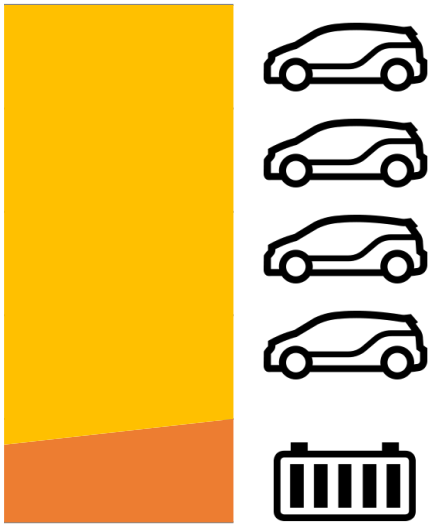
2

BMW selects vehicles for charging delay based upon owner preferences and notifies customers, who can opt out as desired.
Stationary battery provides additional power as needed.
宝马通过用户的倾向选择延迟充电的车辆并通知用户，用户可以选择退出。固定电池提供所需的额外电量。

3

Monitoring equipment verifies that total desired load drop is achieved.
监控设备证实成功实现降低总需求负荷

100 kW



Supporting policies should remove market barriers

扶持政策应消除机制和市场壁垒

US experience shows demand side resources can contribute equally **with** or **without** the development of an organized wholesale market, but enabling policies and regulations must be in place.

美国经验表明，需求侧资源作用的发挥不一定以电力批发市场的存在为前提，但是扶持政策和法规要到位。

Natural Resources Defense Council
自然资源保护协会

- Established in 1970
- International environmental nonprofit organization
- Expertise of some 500 scientists, lawyers and policy advocates
- Two decades working in China since 1996
- NRDC Beijing Office with 40 specializing in policy research, introducing global best practices, and providing technical and legal assistance
- Collaborating with government agencies, research institutes and non-profit organizations to promote green, circular and low-carbon development in China

- 成立于1970年
- 国际环保公益组织
- 以科学、法律、政策方面专家为主力
- 在中国开展工作已有20年
- NRDC北京办公室现有成员约40名。主要工作内容为政策研究，介绍国际先进实践，以及提供技术和法律方面的专业支持。
- 与政府机关、研究机构和国内外公益组织一直积极开展合作与交流，促进中国的绿色、循环、低碳发展。

THANK YOU

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NATURAL RESOURCES DEFENSE COUNCIL
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